HIGH SCHOOL AND UNIVERSITY
MATRICULATION EXAMINATIONS BOARD.

DEPARTMENTAL EXAMINATIONS, 1935.

ALGEBRA 3.

(Durell and Wright)

Time—2½ hours.

Values.

1. Attempt *two* of the following:

8 (*a*) If $\frac{1}{y} : \left(\frac{1}{y} + \frac{1}{z}\right)$ is 2 :5, what is the ratio of $\frac{1}{y} : \frac{1}{z}$?

8 (*b*) What is meant by the statement, "y varies directly as x"?

A cubic block of marble weighs one ton. In what ratio must each of its dimensions be increased to make a block weighing two tons?

8 (*c*) The weight W of a body varies jointly as its height h and the square of the diameter d of its base. Find suitable numbers with which to fill in the blanks in the following table of values:

W	25		7.2
h	2.5	4	2
d	2	0.6	

2. Attempt *two* of the following:

8 (*a*) Sketch the graph of the function $\left(x + \frac{1}{x}\right)$.

For what range of values of x is the function negative?

8 (*b*) A rectangle of altitude x inches is inscribed in an equilateral triangle of side 4 inches. Express the area of this rectangle as a function of x, and show that the maximum area of this rectangle is half the area of the triangle.

Values.

8 (*c*) For what range of values is the function $2 + 3x - 2x^2$ positive? Find also its greatest value.

3. Attempt *one* of the following:

9 (*a*) Plot the graph of the function $10y = x^2$, from $x = -4$ to $x = +4$, computing the values of y for integral values of x.

Find from the graph the average gradient between $x = -1$ and $x = +3$.

Find the gradient at $x = 2$, and check by differentiation.

9 (*b*) Find the ordinate of the point on the graph of the function $x^2 - x - 5$ where the tangent makes an angle of 45° with the axis of x.

4. Attempt *three* of the following:

8 (*a*) If $y = z + z^3$ and $z = 1 + x^2$, prove that

$$\frac{dy}{dx} = \frac{dy}{dz} \cdot \frac{dz}{dx}$$

8 (*b*) A square plot was surveyed to contain 16 square rods. If the surveyor through error made each side of the plot 3 inches too long, what is the approximate error in the area of the plot?

8 (*c*) Solve $\frac{dy}{dx} = x + \frac{3}{\sqrt{x}}$

8 (*d*) Sketch the graph of the function $x^2 - 4x + 5$. Find the area of the figure bounded by the axes, the curve, and the ordinate at the point $x = 2$.

5. Attempt *three* of the following:

8 (*a*) Prove that

$$\frac{101+103+105+\ldots\ldots+199}{1+3+5+\ldots\ldots+99}=3.$$

8 (*b*) In how many ways can a team of 9 players be selected from 13 players, with the proviso that two specified players, who refuse to play together, shall not be on the same team?

8 (*c*) What is the coefficient of x^4 in $(1-x)(1+x)^7$?

8 (*d*) Find an approximation for $(0.998)^3$.

Values.

6. Attempt *one* of the following:

11 (*a*) An experiment to determine the force, P pounds, required to lift a weight of W pounds by a system of pulleys gave the following results:

W	5	10	15	20	30	40
P	1.23	2.15	3.06	3.98	5.82	7.64

Plot P against W. Assuming that the law "obeyed" by these values is linear, draw as well as you can the straight line that fits the points best. Find the equation giving P as a function of W.

11 (*b*) A retired employee who enjoys a pension of $1000 a year will receive 10 more annual payments, the next on January 1, 1936. On that date, what should he accept in cash as the value of the ten payments, money being worth 5%?

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